

MICROCOIL VASO-OCCLUSIVE DEVICE WITH MULTI-AXIS SECONDARY CONFIGURATION

ABSTRACT OF THE DISCLOSURE

A vaso-occlusive device includes a microcoil formed into a minimum energy state secondary configuration comprising a plurality of curved segments, each defining a discrete axis, whereby the device, in its minimum energy state configuration, defines multiple axes. In a preferred embodiment, the secondary configuration comprises a plurality of interconnected closed loops defining a plurality of discrete axes. In a second embodiment, the secondary configuration defines a wave-form like structure comprising an array of laterally-alternating open loops defining a plurality of separate axes. In a third embodiment, the secondary configuration forms a series of tangential closed loops, wherein the entire structure subtends a first angle of arc, and wherein each adjacent pair of loops defines a second angle of arc. In a fourth embodiment, the secondary configuration forms a logarithmic spiral. In all embodiments, the device, in its secondary configuration, has a dimension that is substantially larger than the largest dimension of the vascular site (i.e., aneurysm) in which it is to be deployed. Thus, confinement of the device within an aneurysm causes it to assume a three-dimensional configuration with a higher energy state than the minimum energy state. Because the minimum energy state configuration of the device is larger (in at least one dimension) than the aneurysm, the deployed device is constrained by its contact with the walls of the aneurysm from returning to its minimum energy state configuration. The engagement of the device with the aneurysm wall minimizes shifting or tumbling due to blood flow. Furthermore, the secondary configuration is not conducive to "coin stacking," thereby minimizing the compaction experienced.